Autonomous Real-time Threat-Hunting Robot (ARTHR)

The ARTHR payload, including radiation and chemical sensors. Also shown are handheld PCs and a Nintendo Wii-mote used to interact with the ARTHR payload.

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The Energy of Innovation

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ARTHR is a first-of-a-kind technology invented to morph a passive, dependent mobile robot into an Autonomous Real-time Threat-Hunting Robot. Its intelligence payload enables commercial robots, with plug-and-play sensors, to hunt for and localize deadly hazards and security threats such as irregular oxygen levels, volatile organic compounds, chlorine, ammonia, radioactivity, explosive particulates and land mines.

ARTHR is the first paradigm-shifting system that ports seamlessly between varieties of robot platforms. The key is that ARTHR is not a robot – it is a payload of brains. It's a combination of robust intelligent behaviors, hazard sensors, simple-to-use interface tools and innovative interaction techniques that improve a robot's value and functions in hazardous environments.

Commercial robots with the ARTHR payload, including radiation and chemical sensors.

ARTHR is important because it represents a fundamental and revolutionary change in the way humans will interact and use different robots in time-critical and life-threatening situations. It's not a better joystick, it's not an improved sensor; it's a new and effective way for humans and robots to work safely as teammates while exploring, characterizing and responding to dangers.

A key accomplishment of the ARTHR technology is that the advanced control architecture is universal and can be easily used on a variety of popular robot platforms. ARTHR's control unit offers three different interface choices, including handheld devices, laptops and larger PCs, and innovations such as the Nintendo Wii™ controller.

Perhaps ARTHR's most useful aspect is how it enables a unique trust between independent human-robot teammates and its seamless autonomy designed to automatically select behaviors that achieve operator goals. The autonomy takes place behind the scenes, enabling the operator to focus on hazardous conditions and

responses rather than manipulating the robot. Currently, there's no other existing "cross-platform" product in the country used to operate and interact with multiple robots.

ARTHR's suite of behaviors is based on environmental sensing capabilities on board the host robot that allows the robot to complete tasks even when communications and global referencing are lost. If communications are lost, the robot performs its tasks and reports its findings when communications are restored.

The specialized sensor payloads offered by ARTHR facilitate locating, mapping and identifying threats while reducing operator workload, frustration and task time. Equipped robots autonomously navigate, find and gather intelligence and prepare a virtual map of deadly hazards detected, then communicate the information with little or no human assistance. Its real-time map of the environment and hazards allows the operator to have immediate situational awareness regarding the location of hazards within the environment and the safety levels associated with them.

ARTHR payloads can protect and assist first responders by locating and identifying contaminants and levels of contamination, establishing entry and exit routes, and identifying safe and unsafe areas. These capabilities help responders to better understand on-site conditions and the strategies best suited for containing contaminants, res-
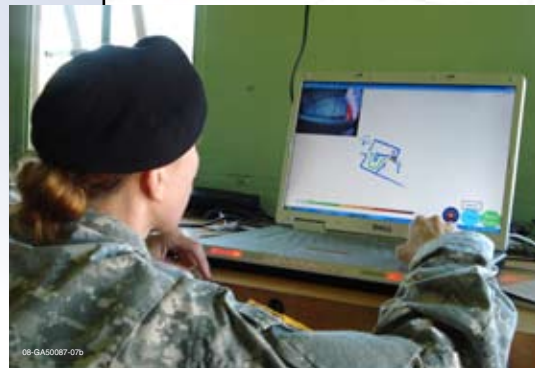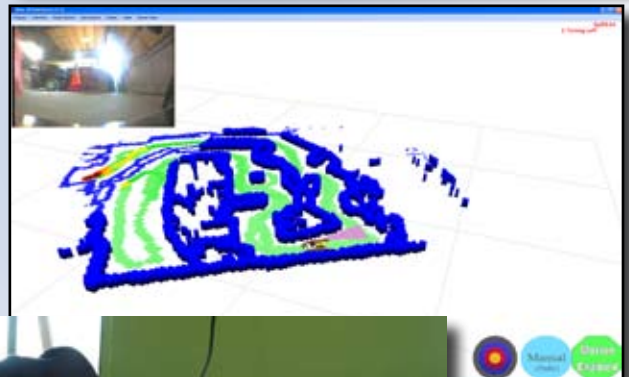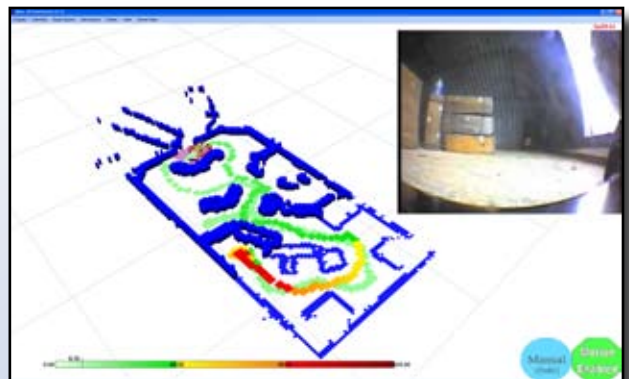
cuing victims and safeguarding the public.

The unique human/robot interface and suite of sensors in ARTHR enable robots to create a clear detailed map and presentation of the robot's environment, and show terrain details and threat locations and intensities. This allows operators to confidently execute timely response strategies from a safe and remote location, when necessary. The interface also enables con-

trol of several threat-hunting robots at once.

ARTHR has been shown to reduce workload, staffing needs, personnel exposure, and the risks faced by first responders by allowing them to simply characterize a hazardous environment without ever entering the environment. It conveniently standardizes training protocols across robot and sensor types, which also saves staff time and increases end-user effectiveness.

ARTHR payloads can protect and assist first responders by locating and identifying hazardous materials and chemicals and establishing entry and exit routes and safe and unsafe areas.

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